

## Accelerator Systems Division Highlights Ending September 30, 2005

### Installation

Craft Snapshot 9/27/05

ASD productive craft workers	39.0
Foremen (Pd by 15% OH)	6.0
HSM management (Pd directly)	3.0
TOTAL AMSI WORKERS	48.0
Less WBS 1.9, 1.2 etc	1.0
Less absent	2.0
TOTAL PD BY ASD/ORNL DB WPs	36.0

### Accelerator Physics

- The prototype nanocrystalline diamond primary stripper foil for the Ring was tested in the LANSCE Proton Storage Ring on 18/Sep. The foil performed well at the full production single-pulse beam intensity of approximately 5 micro coulombs per pulse (at 1 Hz). The next test will be at the production rep rate of 20 Hz.
- Parts fabrication is in progress for the temporary target view screen. Purchase orders have been placed for the fiber optic systems and the fluorescent screens. Two cameras have also been received for testing.
- Work has started on the radiation transport calculations needed to determine temporary shielding configurations and Chipmunk neutron detector placement for ring commissioning.

### Operations

#### Ion Source

#### Survey and Alignment

#### Mechanical

Ring work:

- The Ring Collimator straight section beamline mid-section solenoid was installed.
- The Ring Collimator straight section beamline vacuum misc components' installation continued.
- The Ring Extraction straight section kickers were aligned.
- The Ring Extraction straight section beamline mid-section drift pipe support stand was installed.
- The Ring arc C was aligned
- The RTBT/Target quad magnets' remote water & power connections installation continued.
- The RTBT/Target quad magnets' tunnel utility installation continued.

Water Systems Installation

- The Ring magnet cooling system was flushed to remove any residual resin and refilled.
- Fabrication of a prototype Ring half-cell cooling manifold was started.
- Installation of the PFN oil lines continued in the Ring Service Building
- Installation of water connections to RTBT magnets continued.
- Installation of water connections to RTBT extraction dump magnets was started.
- Fabrication of a prototype Ring half-cell cooling manifold was started.

### Electrical

#### RF

Linac HPRF:

- Discovered a slowly leaking magnet on SCL klystron 11B. Upon removal of klystron/magnet assembly, found water had dripped into the HV oil tank. We are in the process of pumping and filtering the oil and cleaning the tank. Klystron should be replaced early next week.
- All RF techs have started attending a one hour weekly in-house PIC microcontroller class. This device is ubiquitous in the transmitter control systems.

Ring RF

- Conducted preliminary Diagnostics-RF interference measurements with Station RF21 operating at nominal gap voltage.
- Remaining three amplifiers have been connected to their cavities and Power tubes are installed.
- Began looking at operation of the Analog parts of the Low Level RF System.
- Making progress on bringing Low Level RF hardware and software on-line.
- Terminated the RF cables between the Ring Tunnel and the Ring Service Building.
- Reviewed desired software improvements with High Level RF Controls team.

Linac LLRF

- Held a LLRF team meeting to discuss the work plan for Linac LLRF improvements prior to resuming Linac operations in December. The primary objective is to improve the performance of the beam loading compensation.
- Attended the SC Linac planning meeting and presented our work plan to the Accelerator Physics group.
- Preparing for installation of cryomodule 23

## **Cryo Systems**

### **Beam Diagnostics**

#### **BPM**

- New ORNL BPM contact was measured on the ring 26 cm electrode. Impedance dropped to 70 Ohms. Two more prototypes are in the shop, and should be measured today.
- Ring BPM test stand is up and running in the Diagnostics Laboratory. A fully functional RF and Baseband simulation system was fabricated with the help of Jeff Patterson of the controls group.
- Visit from BNL BPM designer Craig Dawson follows this next week

#### **Wire Scanners:**

#### **BLMs:**

#### **Foil Video systems:**

- Foil Video systems were successfully integrated in the lab with EPICS by employing the video EDM widget. The next highest priority tasks are now timing integration and system calibration.
- Mirrors for the folded optics test system have been received and all viewport windows have been found.
- Issue: Although we confirmed that the primary foil will be viewable, it appears that the secondary foil may be partially obscured by the small viewport. We will check this out in more detail next week.
- A more comprehensive system block diagram has been developed and from this, a component list is being generated.
- An IEEE-1394 camera with near IR sensitivity has been received. Support components are on order and initial image acquisition tests should begin next week.
- Reviewed required changes for source test stand emittance station
- Interviewed candidates for software engineering position.

#### **BCM:**

- Test of digitizer: handling over voltage ok, acquisition speed without analysis 30 to 100Hz depending on acquisition length, filter for anti-aliasing to be designed.

## **Controls**

- Papers and poster for the upcoming ICALEPCS Conference and EPICS Collaboration Meetings in Geneva were completed and submitted and a number of potential sites for ICALEPCS '07, to be hosted by SNS, were visited and evaluated. FY'06 Work packages were completed and scrubbed along with other ASD work packages. Many orders were submitted for control system spares and upgrades. The contract for the Central Control Room Northeast arc is ready for release and contracts for all controls contractors were submitted for approval. It remains to be seen if approvals and bureaucratic actions will be completed before October 1
- Model studies of the warm linac RCCS system were completed in collaboration with a visiting team of Russian scientists from INS. Controllability studies were conducted on all ten RCCS systems using 30Hz, 1ms beam. A strategy to minimize recovery time from RF trips was also studied. Below is a result for DTL1 which reduced recovery time from nine minutes to six.
- RF status was added to the cryogenic heater sequences, so that the heater power will be reduced in the cavities where the RF is on. The first test used a simple assumption of 1 W of RF power load per cavity. The tests were not run long enough to demonstrate stability, but overall behavior was as expected.
- Several small improvements were made to the Linac LLRF system. These included allowing start and duration settings for the adaptive feed-forward (AFF) system independent of the RF gate and providing setpoint curve configuration using Matlab. PVs for setting a second feed forward buffer were added, as was support for new firmware with a 'gain ramp' meant to reduce the likelihood of trips during the transition from open-loop 'fill' to closed loop regulation.
- The entire RING controls vacuum equipment is now installed in the racks, including 4 PLCs, an IOC and termination wiring kits. Temporary AC power is available. Vacuum controllers will be installed next week and cables pulls to the ring tunnel have begun. A PLC review on the RING/RTBT PLC code was conducted. Some PLC code was modified as a result, as was the test procedure. The PLC code appeared robust at week's end. These unplanned changes did not impact schedule.
- A prototype version of the planned video foil monitor system was demonstrated, at the same time demonstrating a new video capability for EDM, the SNS display manager used in the control room. During this test, the primary foil system is viewing a beam spot on an oscilloscope's phosphor screen. The spot is a couple mm wide and is 18 feet from the camera. The image data is updated several times per second over the enterprise network and displayed on an EDM screen. The

first image shows the local display of the foil monitor PC-based IOC. The second (right) is the first version of the EDM screen that will be used during ring commissioning.

- Continued support was provided for both LEBT and MEBT chopper experiments. Initial jitter experiments were conducted on the event link hardware that includes newly-designed Event Link Clock/Data recovery circuits I designed for the Choppers
- Checkout of the control system for the ring injection dump was started, but progress is extremely slow due to a number of wiring and documentation problems. The controls team continued to support ring power supply testing. A 4th timing system for ring LLRF commissioning has been assembled in the ring service building. Support was provided in troubleshooting the ring HPRF and LLRF systems. An inventory of power supply control modules was completed. Oscilloscope displays for the ring extraction kickers (top illustration below) were brought on line under EPICS and a prototype injection kicker waveform editor was developed (bottom).
- Five new “Consoles-on-Wheels” (COWS) were assembled and deployed in the field, and a complete inventory of COWS was completed.
- Finalization of Machine Mode tables began for the Injection Dump, Ring, Extraction Dump and Target. Software is ready for all Ring, RTBT and Target MPS IOCs and plans were completed for their installation.
- The Target Building Conventional Facilities (CF) IOC is up and running and linked to the operators’ screens in the Target control room. Two revisions to target controls software (including a few screens and EPICS database) were made and incorporated into current local software.
- Final preparations are in progress to complete the phase 3 PPS which includes certification of the Linac, HEBT, Ring, and RTBT. Tasks include modification of PLC programs to include I/O from the HEBT, Ring, and RTBT; modification of HEBT PLC programs to include I/O from the Ring and RTBT. DH-13 will be operational in phase 3. In addition, PLC programs and EPICS screens are being generated for the Ring and RTBT PPS systems. Field work is complete except for additional chipmunks that have been added.
- Construction of the Target PPS system is 90% complete; equipment fabrication is 90% complete and all procurements are complete. Installation on Instrument BL2 PPS is 40% complete and drawings for the Instrument PPS equipment is at the vendor for quote. The procurement for Target Area radiation monitors (20 units) is complete and associated power and Ethernet cabling is installed. Final calculations to determine stack monitor performance requirements are nearing completion – a vendor visit is scheduled for October and procurement for November.
- An order has been submitted for an additional 20 Chipmunks, to be placed as soon as FY06 funding is available. The plan is to have 13 additional units by end of 2005 with the balance by February 2006. A quote is in hand for Chipmunk ion chambers (to be procured by SNS). The order will be placed as soon as funding is available in October